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June 28

Planetary

6510 Atmosphere of planets
SIZE ESTIMATES OF TITAN'S ATMOSPHERE BASED ON VOYAGER
HIGH PHASE ANGLE IMAGES
F. Ragan (Mail Stop 245-1, NASA Ames Research Center
Moffett Field, CA 94035), J. B. Pollack and P. H.
Smith

Little on the physical properties of the scattering
haze near the top of Titan's atmosphere are de-
rived from data obtained from seven high-phase-angle
images from Voyagers 1 and 2. From the ratio of the
intensity observed at two different high phase
angles, we estimate the haze to be made of the forward-
scattering lobe of the single-scattering phase func-
tion. Comparing the forward-scattering behavior
with diffraction lobes from particles of different
size, we conclude that the average radius of the
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atmospheric depth exceeds 0.19 μ m. Judging from data
collected at four different phase angles, the haze
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and a mean size of $\sim 0.5 \mu$ m. If the width of their
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ume spheres, the highly polarizing nature
of the particles over a broad wavelength band
very unlikely that the particles are spherical. The
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(Titan, aerosol).

J. Geophys. Res., 88, Paper 340795

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Seismology

6505 Body waves
SHOCK WAVE PROPAGATION APPROXIMATION IN THE UPPER
MANTLE BEHAVIOR MODELS
K. Sato (Earthquake Research Institute, University of
Tokyo, Tokyo 113, Japan), K. Sato, and K. Sato

Below the subducting lithosphere is the mantle
to explain the significant seismicity and thermal
activities in the subduction zone. The physical
mechanisms that have been proposed to explain the
observed thermal processes are classified into the
following three categories: (1) a subduction
mechanism, (2) a thermal convection by the mantle,
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News

Cyprus Crustal
Study Project

The Cyprus Crustal Study Project is a joint
venture of the International Crustal Research
Drilling Group (ICRDG) and the Govern-
ment of Cyprus through its Geological Survey
Department. The aim of the project is to carry
out a detailed reexamination of the Trou-
dos, Cyprus, ophiolite, using high-speed dia-
mond drilling combined with extensive sur-
face geological and geophysical studies. The
ICRDG group, comprising about 100 geosci-
entists from eight countries, includes many
participants familiar with ophiolites and with
in situ ocean crust through work from Gábor
Chalmers, thus allowing the ophiolite to be
viewed from a new perspective.

Studies are being concentrated on a section
through the north flank of the ophiolite be-
tween the villages of Agrokippa and Palek-
kari. Research drilling and associated map-
ping in this segment are aimed at providing a
continuous sample through the upper 4 km of
the ophiolite and at sampling the stock-
works beneath the sillite deposits located
within the extrusive section. The Troudos
massive sillite deposits are considered to be
close analogs of the deposited being formed
by active hydrothermal circulation on the
crest of the East Pacific Rise.

To date, the upper part of the extrusive
section has been mapped in detail in the Per-
isterona and Akaki canyons and a section
through the uppermost 485 m of the extru-
sives recovered by drilling. It is planned that
the lower part of the extrusives and the up-
per part of the sheeted complex will be sam-
pled by drilling this fall. The stockwork zones
beneath the Agrokippa A and B are deposits
in the upper part of the extrusive section
have also been drilled to depths of 225 and
630 m, respectively.

Core recovery in both the lavas and the an-
cien hydrothermal systems, at about 200°C,
is excellent in spite of difficult drilling con-
ditions, such as that represented by alterations
of gabbro and altered volcanics with claylike
consistency. Preliminary studies of the core
have provided much new information on the
tectonic setting, alteration conditions, and his-
tory of seafloor hydrothermal systems. A first
report on the results of drilling in the paleo-
hydrothermal system is in preparation.

In addition, an 1850-m-deep section from
the base of the sheeted complex through a
series of gabbros, some showing cumulate
textures, to a series of ultramafic cumulates
has been drilled with a 99.7% recovery rate.
It is planned to extend this hole to about
3000 m this fall. Comprehensive geophysical
logging of these and other holes is scheduled.

An important result of the hole studies is
the primary geochemistry of the Troudos
extrusives is now clearly established.
Samples of fresh volcanic glass, which occurs
widely in the extrusive sequence, indicate that
two distinct suites are present, and the lava
compositions suggest that the ophiolite was
formed in a supra-subduction zone environ-
ment.

It has been agreed by ICRDG that access to
Cyprus Crustal Study Project core will be lim-
ited to present participants for a period of 1
year after completion of the drilling.

Major participants in ICRDG are the Cy-
prus Geological Survey Department, the Fac-
ulty of Earth Sciences, King Abdul Aziz Uni-
versity, Jeddah, Saudi Arabia; and university
and government-based groups in Canada, the
United States, Federal Republic of Germany,
United Kingdom, France, Denmark, and Ice-
land.

Further information may be obtained from
Paul T. Robinson, Project Director, Centre
for Marine Geology, Dalhousie University,
Halifax, Nova Scotia, Canada B3H 3J5.

This news item was contributed by James M.
Hall, Department of Geology, Dalhousie Uni-
versity, Halifax, N.S., Canada.

Merger at MIT

On July 1, the Department of Earth and
Planetary Sciences and the Department of
Meteorology and Physical Oceanography at
the Massachusetts Institute of Technology
(MIT) merged to form the Department of
Earth, Atmospheric, and Planetary Sciences.
This new department will deal with research
in climatology, geochronology, geology, geo-
physics, meteorology, oceanography, and
planetary science. W. F. Brace, former chair-
man of the Department of Earth and Planetary
Sciences, will lead the new department.

The new department contains a Center for
Meteorology and Physical Oceanography,
which will coordinate all efforts in these closely
related areas. In addition, the center will
serve as a focus for MIT's participation in the
physical oceanography portion of the Joint
Program in Oceanography with the Woods
Hole Oceanographic Institution. The director
of the new center is Peter H. Stone, former
head of the Department of Meteorology and
Physical Oceanography.

With approximately 40 faculty members,
180 graduate students, and 45 undergradu-
ates, the new department aims not only to re-
duce the potential for duplication under the
old organizational scheme but also to pro-
mote new, interdisciplinary approaches to re-
search and education involving important en-
vironmental problems. MIT officials also feel
that the new and larger unit will facilitate ad-
ministrative, financial, and teaching support
for the fields involved.

Senior Scientists

A small task force of volunteer senior sci-
entists and engineers was organized recently
under the aegis of the American Association
of Retired Persons (AARP) "to utilize its col-
lective talents for the betterment of society
and to provide opportunities for individual
personal accomplishment and enrichment."
Among the projects under consideration are
assisting the Washington, D.C., school system
to improve its science and mathematics in-
struction and assessing the impact of technol-
ogy on older persons.

One of the task force's first projects is to
develop a roster of retired scientists and en-
gineers in the Washington, D.C., metropolitan

area to garner volunteer talent for future
projects. If you would like to be included in a
mail survey to determine your interests in
volunteer opportunities, send your name, ad-
dress, and telephone number to Barbara
Herzog, AARP, 1909 K Street, N.W., Wash-
ington, DC 20049.

Geophysical Events

This is a summary of *SEAN Bulletin*, 3(5),
May 31, 1983, a publication of the Smithsonian
Institution. The complete bulletin is avail-
able in the microfiche edition of *Eos* as a mi-
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Volcanic Events

Bezymianny (Kamchatka): Ash ejection; pro-
fuse flow; low extrusion.
Klyuchevskoi (Kamchatka): Numerous flank
lava flows; weak summit explosions.
Veniaminov (Alaska): Strombolian activity
and lava flow.
Grimsfjall (Iceland): Subglacial eruption.
Mt. St. Helens (Washington): Lava dome
growth continues.
Etna (Italy): Lava production slows; lava par-
tially diverted; vent crater explosion
continues; self-potential data.
Mauna Loa (Hawaii): Seismicity and summit
caldera deformation increase.
Kilauea (Hawaii): In andescent vents, har-
monic tremor, and dilation across fissure
system continue.
El Chichón (Mexico): Aerosol cloud remains
strong.
Montserrat (Nissanagat): Fumarole chemis-
try changes and temperature drops after
tremor ends.
Manant (Bismarck Sea): Seismicity, ash emis-
sion, in andescent intensity.
Langila (New Britain): Moderate vulcanism
activity, one plume to 7 km.
Ulavan (New Britain): Variable seismicity,
tremor episode.
Bagnan (Solomon Islands): Increased vapor
emission; sluggish lava flow.
Sakurajima (Japan): Explosions and large
plumes; windshields broken.
Kusatsu-Shirane (Japan): March 9 activity was
only seismic.
Ngauruhoe (New Zealand): Earthquake
swarms.
Ruapehu (New Zealand): Decreased seismic-
ity; lake temperature lower.

*Bezymianny Volcano, Kamchatka Peninsula,
USSR (56°07'N, 160°22'E).* Bezymianny be-
gan to erupt May 25, with an preliminary
seismicity. Ash was ejected to 5-6 km height
and covered the E flank of the volcano. The
total area of the ash deposit was about 1500
km². Strong explosions destroyed part of the
Novy (new) lava dome (see below) and a 4-5
km long pyroclastic flow was noted at its E
base. Andesitic lava was extruded from the
crater summit. Since the beginning of the
eruption, the volcano has remained cloud
covered, making observations difficult.

Imagery returned June 1 by the NOAA 7
polar orbiting satellite, showing a dark band
extending about 250 km to the ESE from the
vicinity of Bezymianny above a layer of heavy
weather clouds. Because of the clouds, it was
not possible to locate the dark band's origin
more closely than about 56°N, 160°E, or to
determine if the volcano was feeding the
dark band at that time. Continued poor
weather has prevented additional satellite ob-
servations of eruption plumes from the vol-
cano.

Information contacts: G. Ye. Bogoyavlenskaya,
Institute of Volcanology, Ploshchad' 9,
Petrozavodsk, Kamchatka 685006 USSR;
Michael Natson, Land Sciences Branch,
NOAA/NESDIS, Room 307, Suitland Profes-
sional Center, Washington, DC 20233.

*Veniaminov Volcano, Alaska Peninsula, USA
(56°17'N, 159°38'W).* All times are local
(=GMT - 9 hours). Pilots began to report
eruption clouds from Veniaminov late June 4,
noting that plumes containing some ash rose
to about 4.5 km altitude. Residents of Perry-
ville (population 100, about 25 km S of the
volcano) saw incandescence and dark skies on
June 7 at about 0100. Later that day, U.S.
Geological Survey personnel flew over Veni-
aminov. In the S part of the 10-km-diameter
ice-filled caldera, a small vent on a cone that rises
about 300 m above the ice and had previous-
ly been the site of fumarolic activity. Cherry-
red molten material was ejected several times
per minute to roughly 30-60 m height. The

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on Magnetic
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Los Alamos, New Mexico

Convenor: E. W. Hones, Jr.

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tephra rich, but above that height the plume
was wispy and light gray. About 30 km² of
ice, chiefly to the S and SW, was covered with
a very thin layer of ash. In the past SE of the
cone, a prominent set of ring fractures
defined a circular depression, produced by
subsiding, that was estimated to be about 1.5 km
in diameter and no more than 20 m deep.
By the next U.S.S. overflight, at 1300 on
June 9, strombolian activity was more vigor-
ous, and lava was flowing down the S side of
the cone. Bombs and scoria were ejected ev-
ery 3-5 s to about 2100 m altitude, about 250
m above the summit of the cone. Tephras had
begun to fill the cone's crater, and an increas-
ing number of bombs were falling on its
flanks. Lava flowed from the summit above
the steeply sloping S side of the cone onto the
ice field where a large E-W trending dumb-
bell-shaped depression had formed. Lava
flowed into the W part of the dumbbell and
sank into the ice, from which billowing clouds
of steam were rising. The base of the lava
flow was roughly 100 m in diameter. Open
water was present in the narrow area between
the two parts of the dumbbell, and the E part
was characterized by an unusual fracture pat-
tern. The E part of this feature clearly ap-
proached, but did not touch, the depression
in the ice observed 2 days earlier (see above).
The timing of the beginning of lava flow ac-
tivity was uncertain, but a pilot who flew past
the volcano at 1330 on June 8 saw no steam
clouds, so lava probably had not begun to
flow onto the ice by then.

A short-period seismic instrument located
at Ivanof Bay, about 30 km from the volcano,
was operating in its standard event-triggered
mode until it was reset to record continuously
on June 8. Between June 8 and 10, it record-
ed nearly continuous low-amplitude tremor,
with occasional larger discrete bursts that
reached preliminary magnitudes of 1-2.
No unusual discharge from streams drain-
ing the caldera was observed. An eruption
from Veniaminov was last reported in
1944.

Information contacts: Thomas Miller, U.S.
Geological Survey, 1209 Oryza St., Lancaster,
AK 99501 USA; Stephen McNitt, Lamont-
Doherty Geological Observatory, Palisades,
NY 10964 USA.

*Grimsfjall Caldera, S. Iceland (64°42'S,
17°33'W).* All times are GMT. The following
report is from Karl Grönlund, Páll Einarsson,
and Helgi Björnsson. "A subglacial volcanic
eruption started in Grimsfjall below the west-
ern part of the ice cap Vatnajökull on May 28
or 29. The central part of the Grimsfjall area
is a caldera of about 85 km². This is one of
the most active volcanic and geothermal areas
in Iceland.

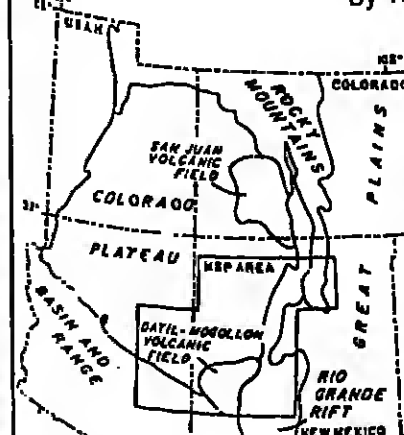
"Melting of ice due to intense geothermal
activity and continuous inflow of ice causes a
gradual buildup of melt water below the 200-
m-thick floating ice shelf in the caldera. This
buildup culminates in a jökullhlaup (glacier
burst) when the level of the lake reaches a
certain threshold value. The water drains in a
catastrophic flood beneath the ice, 50-60 km
into the rivers on the sandur plain Skeidarár-
sandur south of the ice cap. The jökullhlaups
last about 3 weeks and occur about once to
twice every decade, the last one in January-
February 1992.

"The last definite volcanic eruption in the
caldera was in 1931, but small eruptions may
have occurred since without being noticed
due to the remoteness of the area. In most

Nature (June 16, 1983)

Geologic Map of the Rio Grande
Rift and Southeastern Colorado
Plateau, New Mexico, and Arizona
(1983)

by W.S. Baldrige, Y. Bartov, and A. Kron



- Full 11-color map • 36" by 48"
- 2-sided map • Referenced and annotated

This map indicates the geologic and structural
relationships among the varied tectonic
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News (cont. from p. 411)

cases, known previous eruptions have been accompanied by jokulhlaups. The new eruption was preceded by an intense earthquake which began at about 0400 on May 28. The largest earthquakes were in the magnitude range 5-5.5. Earthquake activity declined at about 1000, and soon after that bursts of volcanic tremor began to appear on the seismograms. The tremor amplitude increased at about 1500, and intense bursts of tremor were recorded for the rest of that day and the next. During the following days the tremor gradually decreased in amplitude.

"The first seismic observation of the eruption was on May 29 at 1030 from an overlying aircraft, diverted to fly over Grímsvötn by request from seismologists. At that time the eruption had broken through the ice and produced a 5-km-long very thin ash fan downwind on the ice cap to the south of Grímsvötn. Steam clouds were observed in the direction of Grímsvötn on May 28 at about 2115. Weather satellite images on May 29 show a long narrow citrus cloud that almost certainly originated at Grímsvötn during the morning of May 29, at 0500 at the latest.

"When the eruption was observed on May 29, an opening had formed in the ice shelf inside the caldera near the SW wall. This lake was oval shaped, about 300 m in diameter, and, during May 29, was covered by raft ice from the overhanging caldera wall. Explosions were observed in the lake at varying time intervals. The highest explosions reached about 50 m, but the accompanying steam columns reached 1-2 km. During the next few days, weather conditions prevented direct observations except the height of the steam column. On May 30, a maximum height of 6-7000 m was observed; on May 31, 7-8000 m; and on June 1, about 5000 m. The steam column was intermittent but never continuous. After that, no activity has been observed, but on June 5 a small island was observed in the steaming lake.

"No change has been observed in the rivers that drain the glacier. At this time, it is not known whether the eruption has affected the lake level within the Grímsvötn caldera."

Information contacts: Karl Grönvold, Nordic Volcanological Institute, University of Iceland, Reykjavik, Iceland; Páll Einarsson and Helgi Björnsson, Science Institute, University of Iceland, Reykjavik, Iceland.

Earthquakes

The May 2 earthquake, centered in the San Joaquin Valley, was felt across central and S California and in W Nevada. Hardest hit was Coalinga, where 90% of the business section and 20% of the homes were destroyed or damaged beyond repair. Of the 48 persons injured, 20 remain in serious condition; no one was killed.

The earthquake on May 10 occurred in St. George's Channel, between New Britain and New Ireland, about 40 km SE of Rabaul, New Britain, Papua New Guinea. No damage or casualties were reported. The May 15 shock in E Madison County about 80 km E of St. Louis, Missouri, was felt from NE Arkansas to SW Indiana, especially in SE Missouri and S Illinois. Windows broke in New Athens, Illinois, about 65 km SSW of the epicenter. The epicentral area is about 160 km N of the N end of the New Madrid fault zone, and is not associated with it.

At least 13 persons died in the May 26 earthquake that struck N Honshu and S Hokkaido. Another 47 were drowned, and at least 55 were missing and feared killed by the tsunami that followed it. The earthquake was centered in the Sea of Japan about 120 km NW of Akita, the most seriously damaged city, where the intensity was 5 on the Japan Meteorological Agency scale of 7. Within 30 min of the main shock, tsunami of 3-4 m

height swept the NW Japanese coast. Most casualties and damage occurred N of Akita, along the Oga Peninsula and in Noshiro and Junsai on Honshu; at least 150 boats were destroyed. In Korea, three persons were drowned by tsunami, 64 ships lost, and 10 homes washed away. Tsunami arrived on the USSR's Maritime Territory coast an hour after the earthquake. Near Vladivostok, several ships were damaged and a person washed overboard. Farther north a fishing fleet was damaged.

Information contact: National Earthquake Information Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Box 25046, Denver, CO 80225 USA; Larry Larson, Fresno Bco, Fresno, CA 93786 USA; Roy Manning, Fresno County Office of Emergency Services, Suite 800, 2220 Tulare, Fresno, CA 93721 USA; Mark T. Woods, St. Louis University, Geophysics, Box 8099, LaCleve Station, St. Louis, MO 63156 USA; Tokiko Tiba, National Science Museum, Department of Geology, 3-25-1 Hyakunin-cho, Shinjuku-ku, Tokyo 160, Japan; George Parasaravayannis, International Tsunami Information Center, P.O. Box 50027, Honolulu, HI 96850 USA; The Japan Times, Tokyo, Japan; Kyoto News Service, Ltd., Kyoto, Japan; Sovetskaya Rossiya, Moscow, USSR; Unifit Press International.

Meteoritic Events

Fireballs: Germany: mid-Atlantic area, Georgia, Nebraska, Pennsylvania, USA

Geophysicists

William I. Asford, vice chancellor of Victoria University in New Zealand, was recently elected a foreign associate of the National Academy of Sciences (Eos, June 14, 1983, p. 412).

Eddie N. Bernard has been appointed director of the Pacific Environmental Laboratory in Seattle, Wash., a major oceanographic research facility of the National Oceanic and Atmospheric Administration (NOAA). As acting director of the laboratory for the past year, Bernard, a physical oceanographer, has directed a number of NOAA research projects involving marine geochemistry, ocean circulation, marine resources, and ocean-atmospheric interactions.

John T. Jeffries, an astrophysicist specializing in stellar atmospheres and other astrophysical plasmas, has been appointed director of the newly consolidated National Optical Astronomy Observatories (NOAO). The Association of Universities for Research in Astronomy, Inc. (AURA) operates the facilities under contract with the National Science Foundation. Headquartered in Tucson, Ariz., NOAO will include three observatories: Kitt Peak National Observatory (with facilities in Tucson and on Kitt Peak), the Cerro Tololo Inter-American Observatory (with facilities in La Serena, Chile, and on Cerro Tololo in the foothills of the Andes), and the National Solar Observatory (a recently formed facility consisting of the solar instruments on Kitt Peak and Sacramento Peak in New Mexico).

On July 1, Richard S. Lindzen became a professor in the Massachusetts Institute of Technology's new Department of Earth, Atmospheric, and Planetary Sciences. Lindzen, formerly the Robert P. Burden Professor of Dynamic Meteorology at Harvard University, will hold the Alfred P. Sloan Chair in meteorology. He is a recipient of AGU's Macelwane Award and the Meisinger Award of the American Meteorological Society. He is a member of the National Academy of Sciences.

T. N. Narasimhan, staff senior scientist of Lawrence Berkeley Laboratory's Earth Sciences Division, now has a concurrent appointment as professor-in-residence in the Department of Materials Science and Mineral Engineering of the University of California, Berkeley.

Eric S. Posner, chairman of the Marine Sciences Department at Southampton College of Long Island University, and visiting associate professor of atmospheric sciences at Dartmouth College, received Long Island University's Trustees Award for Scholarly Achievement.

Charles M. Tesler, National Academy of Science Research Fellow at NASA's Ames Research Center, has accepted a position at the Space Science Laboratory of NASA's Marshall Space Flight Center in Huntsville, Ala.

In Memoriam

The following AGU members are recently deceased:

Martina Masland, 58, died March 20, 1983. A member of the Hydrology section, she joined AGU in 1956.

John Zimmerman, 65, died May 4, 1983. A member of the Ocean Sciences section, he joined AGU in 1953.

Date	Time, GMT	Magnitude	Latitude	Longitude	Depth of Focus	Region
May 12	2345	6.5*	36°25'N	120°50'W	10 km	Cent. California, USA
May 10	1827	8.5 m.p.	4°58'S	182°51'E	shallow	New Britain
May 15	0516	4.4 m.p.	38°74'N	89°50'W	11 km	SW Illinois, USA
May 26	0300	7.8M _s	40°56'N	139°09'E	shallow	Honshu, Japan

*6.5 ML; University of California at Berkeley.

Books

The Three Voyages of Edmond Halley in the Paramore: 1698-1701

Norman J. W. Thrower (Ed.), Hakluyt Society, London, 1981, £20.

Reviewed by Duncan Carr Agnew

On Thursday, October 20, 1838, a three-masted ship, captained by Edmond Halley with orders "to improve the knowledge of the Longitude and variations of the Compass," which he was to observe "with all the accuracy you can," set sail from Deptford, England, on the first leg of the first voyage ever commissioned for strictly scientific purposes. Halley is now best known as an astronomer and for the comet that bears his name. However, his interests ranged over so many specialties that he is better described now by the 17th century title of "natural philosopher." Among his various areas of study, the study of the earth took a major place, as shown by his many papers on the trade winds, the tides, and especially the magnetic field. This last interest led him to propose to the Royal Society that he make a voyage around the world "to discover what may be learnt . . . [of] the variations of the Magnetic Needle." This ambitious undertaking was later scaled down to cover only the Atlantic Ocean. Halley made two voyages from 1698 to 1700, at one point reaching 52°S in his 32-foot vessel. As a tail-piece he made a third voyage in the summer and fall of 1701 to study the tides and tidal currents of the English Channel.

All this is set out in sumptuous detail in this edition of Halley's journals, issued by the Hakluyt Society as one of their publications of records of travel and exploration. Thrower has done a major job of editing the journals, reproducing the original format so far as printing will allow, and noting all significant variants between the manuscript available and the versions published by Dalrymple in 1775. He has also provided an informative introduction and footnotes and printed all the supporting documentation in a section following the journals. This additional material well supplements the sometimes dry journal entries and provides an informative glimpse of the background of the three voyages.

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For further information, call toll free 800-424-2488 or, in the Washington, D.C. area, 462-6903.

POSITIONS WANTED

Hydrogeologist. M.Sc. and 10 years experience both U.K. and overseas with position outside U.K. Experience in design, modelling, project appraisal, resource evaluation, aquifer thermal energy storage and leaching/training. Fluent Spanish. Box 911, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

POSITIONS AVAILABLE

Florida International University/Faculty Positions in Geology. The Earth Sciences program at Florida International University is expanding and plans to increase the number of its faculty positions in the next few years. In order to complement existing in-service applications for research strengths, the university invites applications for tenure track positions at the assistant professor level in the following areas of specialization:

- Stratigraphy/Sedimentology
- Geophysics/Marine Geology
- Igneous Petrology/Geochemistry/Economic Geology

Successful applicants must have demonstrated an ability to conduct high-quality teaching and the potential to establish a productive research program in their area of specialty.

Subject to final approval of funding, appointments will begin in August 1983 (deadline for application July 30, 1983) and/or January 1984 (deadline for application November 14, 1983).

Send a resume, brief description of teaching and research interests, transcripts and three letters of recommendation to:

Dr. L. Keller
Department of Physical Sciences
Florida International University
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ARS Research Associate

Hydraulic Engineer, GS-810-11 or 12, at the USDA Sedimentation Laboratory, Oxford, Mississippi. Incumbent will develop computer methods for mathematically simulating runoff and sediment movement on intensively cropped agricultural land and study sediment losses from cropland having a range of typical soil, cropping, and topographic conditions at different rainfall intensities and durations. Using available experimental field data on erosion, runoff, and sediment size distributions. Must have expertise in hydraulics of runoff flow, sediment transport by water, and computer programming. This is a term appointment not to exceed 2 years. Salary (\$26,989-\$29,374 per annum) based upon qualifications and experience. This is a Federal Civil Service position. Applicants must be U.S. citizens. For application procedures, contact Vanessa Mathews, USDA, ARS, SRAC, H-2, P.O. Box 58326, New Orleans, LA 70153. Telephone: (504) 589-4316.

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Physical Oceanography/University of Rhode Island. A postdoctoral research associate position is available starting October 1, 1983 for studies of tropical processes in the Pacific. The research involves the collection and analysis of data relating to the dynamic topography and zonal pressure gradient of the equatorial current systems as part of a long-term study of ocean influences on climate. Submit resume and professional references by August 15, 1983 to: Dr. C. Randolph Watts, Marine Research Associate II position, UNIVERSITY OF RHODE ISLAND, P.O. Box 557, Kingston, Rhode Island 02881.

An affirmative action/equal opportunity employer.

University of Arizona/Faculty Position. The Department of Hydrology and Water Resources invites applications for a faculty position in hydrology with a specialty in ground-water chemistry. Candidates must have training and/or professional experience in hydrology and must have demonstrated abilities in the quantitative aspects of the topic. A position will be at the level of an assistant or associate professor. Interested individuals should obtain further information from:

Professor Stanley N. Davis
Chairman, Search Committee
Department of Hydrology and Water Resources
University of Arizona
Tucson, Arizona 85721
602-621-3131

The University of Arizona is an affirmative action/equal opportunity employer.

University of Colorado, Boulder, Geochimist Position. Geochimist with active research program in stable isotopes, radiative isotopes, and trace elements is being sought for a joint appointment in the Department of Geological Sciences and the Center for Research in Environmental Sciences (CRES) of the University of Colorado.

The one-half time position within the Department of Geological Sciences is tenure track at the assistant or associate professor level with a starting salary of \$12,000-\$15,000 for the academic year. Teaching load will be half that of full-time faculty. The position within CRES will be as a Fellow with appropriate office and laboratory space. One-half academic year salary will be guaranteed by CRES for two years at the departmental rate, after which incumbent must generate his/her CRES salary from external sources. Incumbent may augment salary further by generating three months of summer salary from contracts and grants, and consulting.

Applicants with experience, publications, and/or mobile existing research equipment preferred. Preferred starting date would be January 1, 1983. Closing date for applications is October 1, 1983. Applications should include statement of research and teaching interests, experience, a full vitae, and four letters of reference.

Apply to: Professor Charles Stern, Chairman, Geochimist Search Committee, Department of Geological Sciences, Campus Box 250, University of Colorado, Boulder, CO 80502.

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LEADER, OCEAN SCIENCES DIVISION

The Office of Naval Research is seeking an outstanding individual to serve in this Civil Service position in the Senior Executive Service. Salary range is \$56,945 to \$67,200, depending on qualifications.

The Leader, Ocean Sciences Division is responsible for providing leadership, coordination and technical quality assurance for a \$19 million program in physical, chemical, biological and coastal oceanography and in marine meteorology. Areas of responsibility include the development and maintenance of a dynamic and comprehensive plan for basic and applied research efforts, for developing financial support for programs derived from this plan, and for a continuous process of review and evaluation of Navy and DoD needs.

Candidates should possess a Ph.D. or equivalent experience in oceanographic, coastal or meteorological sciences, which has provided a broad and comprehensive knowledge of environmental sciences with emphasis on chemical, biological or physical oceanography and/or meteorology. Considerable experience in administration and management of research and its application to development is necessary.

Interested persons should submit a resume or Standard Form 171, Personal Qualifications Statement (available at Federal Job Information Center or from the address below), to:

OFFICE OF NAVAL RESEARCH
Civilian Personnel Division, Code 781SC
ATTN: Announcement #83-15 (EOS)
800 North Quincey Street
Arlington, VA 22217

Applications will be accepted through 31 August 1983 and must be received by that date.
An Equal Opportunity Employer U.S. Citizenship Required

Selected/Engineer: Airborne Research Associates. Airborne Research Associates has an opening for a versatile self-directed scientist/engineer skilled in electronics and programming to participate in interesting geophysical research. We operate two uniquely instrumented aircraft capable of measuring electric fields, conductivity, the turbulence structure (function parameters), and most other meteorological variables as well as conducting photogrammetry. Flying is done over the ocean and at high altitudes. All work is basic research on our own programs as well as in collaboration with university and government groups. Research areas include thunderstorms and fast weather atmospheric electricity, ionospheric relationships, turbulence, marine boundary-layer processes and computer controlled satellite image analysis. The company is small with associated advantages and disadvantages. The applicant must be capable of working many different functions, be able to be comfortable around aircraft, capable of calibrating and improving instrumentation (including electro-mechanical tasks), flying as observer, testing and analyzing data, writing reports and articles, and sometimes sweeping the floor and feeding the dog. The job at times involves long hours, field trips and demanding schedules. There is the potential for designing research and initiating new programs. Personnel at the B. to Ph.D. level in atmospheric science or experimental physics could fit in. Send resume, salary requirements and three references to: Dr. Ralph L. Marks, Airborne Research Associates, 1000 Commonwealth Road, Weston, MA 02157. No phone calls please, will be away until mid-August.

Postdoctoral Position/Naval Postgraduate School. The Ocean Technology Laboratory has available a postdoctoral position for a person interested in the analysis and interpretation of acoustic bubble data. The tenure is for one to two years. The successful candidate should have a Ph.D. in physical oceanography and although experience with turbulence data is preferable it is not essential. The opportunity for involvement in data gathering expeditions is also available. Resumes can be sent to: Dr. R.L. Luck, Code 600, Naval Postgraduate School, Monterey, CA 93940.

An Equal Opportunity/Affirmative Action Employer.

Selenologist, Geophysics/Carnegie Institution of Washington. A postdoctoral position is available as a selenologist at the Department of Terrestrial Sciences, University of Maryland, College Park, Maryland. The position is for a selenologist/geophysicist with broad interests. Please send resume and request three letters of reference to be sent to: Geophysics Fellowship Committee, Department of Terrestrial Sciences, Carnegie Institution of Washington, 5241 Broad Branch Road NW, Washington, D.C. 20015.

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Visiting Research Scientist Radio Emission Processes

Applications are invited for a visiting research scientist position in the Department of Physics and Astronomy, The University of Iowa, Iowa City, Iowa.

This position is intended to support a multidisciplinary study of planetary, solar and astrophysical radio emission processes funded by the NASA Innovative research program. Applicants must have a Ph.D. with a good theoretical background in basic plasma physics and experience in either experimental or theoretical studies of planetary, solar or astrophysical radio emissions. Our intention is to favor established scientists with research experience in this area, although junior scientists with an appropriate background will also be considered. The salary will be commensurate with the experience level. The appointment can be for any period up to one year, with a possibility for extension to a second year, depending on funding constraints. Send curriculum vitae and a list of three references to:

D. A. Gurnett
Department of Physics and Astronomy
The University of Iowa
Iowa City, Iowa 52242
Telephone 319/353-3527

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GEOTECHNICAL ENGINEER

The Department of Civil Engineering, University of California, Davis invites applications for a tenure track position in the area of Geotechnical Engineering starting September 1984. Initial appointment is expected to be at the Assistant Professor level, however, exceptionally qualified candidates may be considered at the Associate Professor level. Duties will include teaching undergraduate and graduate courses and developing research in Geotechnical Engineering. The individual filling the position should have a good theoretical background in soil mechanics; some experience in centrifuge (or other physical) or numerical modeling of geotechnical structures is highly desirable. Candidates must have a doctorate degree in engineering. Applicants should send complete resume, relevant publications, transcripts, list of three references with addresses and statement of research interests by February 1, 1984 to Professor C. K. Shen, Department of Civil Engineering, University of California, Davis, CA 95616.

THE UNIVERSITY OF CALIFORNIA IS AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION EMPLOYER AND INVITES APPLICATIONS FROM ALL QUALIFIED INDIVIDUALS.

Low State University of Science and Technology, Department of Earth Sciences/Research Associates, Electronics and Microprobe. The Department of Earth Sciences offers applications for a Research Associate position as an electron microprobe specialist. The appointment will be full time, permanent, twelve-month position. Salary will be commensurate with qualifications.

Primary duties are the operation and maintenance of a fully automated microprobe with WDS and EDS capabilities and the supervision of associated laboratory facilities. Additional duties include the instruction of research personnel in instrument operation. Ample opportunities exist for conducting collaborative and independent research involving the microanalysis of geological materials.

Applicants should have a M.S. degree in a science or engineering field, or equivalent experience, and experience with electron microprobe operation. Persons with a working knowledge of WDS and EDS spectrometers and the accompanying computer operations and experience analyzing geological samples will be preferred applicants.

Application deadline is July 31, 1983. Later applications will be accepted if the position is not filled.

Applications should include a complete resume, a statement of background and interests, copies of publications and names of at least three references. Applications should be sent to:

Bert E. Nordlie
Department of Earth Sciences
Low State University
253 Science
Ames, Iowa 50011

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Professor of Meteorology/University of Maryland.

The Department of Meteorology at the University of Maryland, College Park, invites applications for a tenure line professorship. We seek a well-established, highly recommended scientist with an outstanding international reputation in atmospheric and oceanic modeling and applications. We propose the establishment of a center in the study of the interaction of atmosphere, ocean and land processes and their impact on climate variability, and in particular to study the feasibility of short term climate predictions. The applicant should be qualified to head such a center, plan its projects, organize its activities, and bring to the University the necessary resources to attract outstanding scientists to the center and to carry out its research functions. Salary is negotiable. To apply, please send a complete curriculum vitae and the names of references to the Chairman, Search Committee, Department of Meteorology, University of Maryland, College Park, MD 20742. Applications received by July 1983 will receive full consideration.

The University of Maryland subscribes to policy of equal educational and employment opportunity.

The University of Maryland is required by Title IX of the Education Amendment of 1972 not to discriminate on the basis of sex in admission, treatment of students or employment.

CNOOC Chair in Mapping, Charting and Geodesy (Hydrography) Department of Oceanography, Naval Postgraduate School, Monterey, California. Under the sponsorship of the Commander, Naval Oceanographic Command (CNOCC) a Chair in Mapping, Charting, and Geodesy (MCGC), with emphasis on hydrography, has been established in the Department of Oceanography, Naval Postgraduate School (NPS). The objective of the Chair is to promote MCGC studies and research by students and faculty, and to encourage acquaintance of the Chair with Navy needs in the MCGC field.

The incumbent's principal responsibilities will be to conduct research and to supervise student thesis research of a type that will interface the Hydrographic Science Program of NPS with the MCGC needs of the Navy. A favored theme is research applicable to operational hydrographic survey problems.

Academic excellence and the ability to bring forth new ideas are the primary considerations in the selection process. The term of appointment will normally be for twelve month periods (1 October to 25 September); however, exceptions will be considered. Candidates may be members of the academic, federal, or private sectors. Where appropriate, Intramural or Personnel Agreement are preferable. For further information, contact Professor G.N.K. Mooney, Chairman, Department of Oceanography, Naval Postgraduate School, Monterey, California 93940, telephone number (408) 646-2673. Send curriculum vitae/resume information and letters of interest to interest in the above address of NPS with the MCGC needs of the Navy. A favored theme is research applicable to operational hydrographic survey problems.

The Naval Postgraduate School is an Equal Opportunity/Affirmative Action Employer.

Geophysicist/University of Saskatchewan. Subject to final budgetary approval, the Department of Geological Sciences will have a new tenure position in geophysics available July 1, 1984. Applicants should hold or be about to receive the Ph.D. or equivalent degree. They will be expected to teach undergraduate and graduate courses in geophysics and to hold and maintain a vigorous research program. Excellent research opportunities exist in the field of geophysics and in all fields of mining geophysics. The department, to occupy a new building in 1985, already has well-equipped geophysical and data-processing facilities. Applicants should send a letter outlining their research and research goals, accompanied by a full curriculum vitae including the names of at least three references, to Dr. W. G. E. Caldwell, Head, Department of Geological Sciences, University of Saskatchewan, Saskatoon, Canada S7N 0W0.

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Chairman—Department of Geological Sciences, Wright State University. The Department of Geological Sciences, invites applications for the position of chairman, to be appointed September 1981. We seek a dynamic individual with administrative talent and an appreciation for research and teaching in geological sciences. Rank is at the full professor level and no restrictions have been placed on areas of specialization. The department is active with 12 faculty and an emphasis on professional practice yet maintaining a firm commitment to basic research.

Send a letter of application, curriculum vitae and names of three references to: Chairman, Search Committee, Department of Geological Sciences, Wright State University, Dayton, OH 45435. Wright State University is an affirmative action/equal opportunity employer. Closing date for the position is October 31, 1983.

Student Opportunities

Graduate Assistantship/Honorary University. Howard University in Washington, D.C., offers new graduate program for the M.S. degree in geology. Students must have a B.S. degree in geology. Areas of specialization are field geology, geophysics, and meteorology. Graduate students will receive a stipend and tuition. For more information, contact: Dr. Eric Christensen, Department of Geology and Geography, Howard University, Washington, D.C. 20059.

Qualifications: skills and experience in analysis of mineralogical and petrological data; ability to implement an analytical technique; skill in development of computerized models; and application of numerical and statistical techniques. Minimum 1 appointment as a postdoctoral fellow or equivalent level of research. Salary: \$25,811 to \$37,722 annually. Top salary for full-time position. For consideration, send a letter of application, curriculum vitae, and a recent photograph to: Dr. Eric Christensen, Department of Geology and Geography, Howard University, Washington, D.C. 20059.

An equal opportunity/affirmative action employer.

Student Opportunities

Graduate Assistantship/Honorary University. Howard University in Washington, D.C., offers new graduate program for the M.S. degree in geology. Students must have a B.S. degree in geology. Areas of specialization are field geology, geophysics, and meteorology. Graduate students will receive a stipend and tuition. For more information, contact: Dr. Eric Christensen, Department of Geology and Geography, Howard University, Washington, D.C. 20059.

My next piece of good fortune came in 1951 when I was asked to build a high-pressure laboratory at a new institution of the University of Tokyo: the Institute for Solid State Physics. Since it was practically impossible to find a high-pressure experimental physicist in Japan before 1960, I was fortunate to move from the Geophysical Institute to the new institution. It was advantageous for me to have been able to start high-pressure geophysics research in Japan in the early 1960s.

In the 1950's, Francis Birch and Ted Ringwood, who have been my permanent heroes in earth sciences, had built up a sound foundation in the field of high-pressure geophysics and geochemistry. They conclusively demonstrated the importance of the high-pressure phase transformation of silicate minerals for understanding the earth's deep interior. Thus, in a qualitative manner, I could follow without hesitation the track they had developed. However, in a quantitative manner, there remained many unsolved technical problems at that time concerning the generation of very high pressure, temperature measurements at high pressure, and pressure determination at high temperature. For instance, Francis Birch commented on the uncertainty of high-pressure research in his very famous JGR paper in 1958 as follows. He stated: "Unusually readers should take warning that ordinary language undergoes modification to a high-pressure form when applied to the interior of the earth." Here are a few examples given by him: "dubious in the high pressure form means certain, perhaps means undoubtedly, vague suggestion means proof. This comparison of the language usage indicates symbolically the state of the art of high-pressure geophysics research in the 1950's. Under the situation, I decided to make it my consistent aim to improve the capability of the high-pressure apparatus and the accuracy of the pressure-temperature measurements.

The first thing to do in my laboratory was to construct a new high-pressure and high-temperature apparatus suitable to our present purposes. I undertook the challenge to build a tetrahedral anvil type of apparatus with large sample volume by using techniques developed in Japan. Fortunately, this choice was quite successful, and the tetrahedral anvil press has been working as well as I had expected for more than 20 years. The success of the tetrahedral anvil apparatus brought a boom in constructing many different types of multi-anvil systems in Japan. I also had the good fortune to have financial support from the Japanese government in constructing some of these multi-anvil systems subsequently developed.

This large volume equipment made it possible not only to carry out research on the various physical properties of minerals and rocks under high pressure and high temperature but also to synthesize many specimens of these high-pressure minerals. It was a great pleasure for me to come into an international collaboration with many distinguished scientists throughout the world by supplying them the samples of high-pressure minerals. Through these collaborations, a number of new devices were developed in my laboratory. For example, the necessity of high quality single crystals of high-pressure minerals for Brillouin scattering measurements stimulated the development of a new technique in crystal growth under high pressure. I would like to emphasize here that the development of new techniques and devices in research in extreme environments always opens a new research field. This is particularly true in high-pressure geophysics research. Successful synthesis of single crystals of high-pressure minerals led to a remarkable advancement in crystal chemistry. The diamond-anvil cell developed by U.S. high-pressure researchers literally opened a window in understanding the deep interior of the earth.

The frontier of high-pressure geophysics

research has been constantly shifting to the deeper region of the earth over the past 30 years. My interest in high-pressure phase transformation of upper mantle minerals stimulated by the pioneering studies of Francis Birch and Ted Ringwood is now growing into problems relating to the chemical composition of the earth's core and the core-mantle process. I must thank my good fortune to have had the invaluable help of my colleagues and graduate students in adapting my laboratory to the frontier of high-pressure geophysics research in its every stage of advancement. I believe that this is the greatest piece of my good fortune. Without their assistance, no work would have been accomplished in my laboratory. Particularly, on this occasion I would like to express my sincere thanks to Yasuhiko Syono for his important contribution to the construction of my high-pressure laboratory at the initial stage of my research.

Thank you again, Boh Lieberman, for your generous invitation. It is a great pleasure to accept this Bowie Medal on behalf of all my colleagues as well as myself.

Syun-iti Akimoto

Membership Applications Received

Applicants for membership have been received from the following individuals. The letter after the name denotes the proposed primary section affiliation; the letter A denotes the Atmospheric Sciences section, which was formerly the Meteorology section.

Regular Member

Lisa Anderson (S), Maurice Aubert (G), Russ T. Brown (H), F. G. Chiklis (S),

Geoffrey B. Crew (SM), Drew K. Davis (H), Walter Dragoni (H), Robert M. Duckworth (S), Charles R. Eastwood (SM), Richard A. Hoover (S), Robert N. Hoy (H), Paul F. Jensen (O), Raymond C. Johnson (H), Karl-Erik Kasapiglu (T), Brian G. Katz (H), John B. Komer (A), Bruce Laurip (H), Bruce Lofis (H), Charles A. Mon (A), J. Theodore Moine (H), Hakyon E. Morris (S), James L. Muller (S), Neal R. Pettigrew (O), Paul Schopf (O), Pankaj Sharma (O), Mitsuo Shimizu (V), Joseph L. Shultz (O), Herman Sievering (A), David N. Steinhardt (T), Keith R. Thompson (O), Thomas J. Trombley (H), Jean Marie Vasilek (G), Christopher White (H), Barbara L. Yoon (A).

Student Member

Joan Barry (V), Marc Bernstein (V), Leslie Bulsroer (V), Fainalio Bouell (SA), Nancy A. Breen (T), Russell O. Colson (V), Wesley R. Dunsin (H), Laurel A. Di Silvestro (S), James Doherty (H), Mark Stephen Drummond (V), Paul S. Dysart (S), Isang Okun Essien (A), Stephen Fuceller (SS), Kai-Shen Hwang (GP), Timothy H. Keho (S), Rosemary A. Korn (SS), Linda Kracker, Christopher A. Kuhl (T), Omar G. Lizaro, Philip Lowry, Jonathan I. Lunn (P), Laura M. Maier (A), Alan McNichol (O), Mark A. Moens (V), Samuel B. Mukawa (V), Wan Mokhar Nawang (H), Jose Peche (O), Suzanne Prestlund (H), Gregory J. Preziosi (S), Suzanne Reynolds (D), Chris O. Sanders (S), Anne C. Smith (SM), Allan Smith (GP), Charles H. Swann (S), Carlos M. Valdes-Gonzalez (S), Richard J. Walker (V), Brian J. Williams (O), Lorraine W. Wolf (S), Deborah Ann Zankowski (O).

Associate Member

D. G. Brown (H), Jan Falk (H), Jani Minich (S), Rod Skutumpah (H).

AGU

1983 William Bowie Medal to Syun-iti Akimoto

Citation

The 45th William Bowie Medal is awarded to Syun-iti Akimoto for his pioneering work in the application of high-pressure, high-temperature research to geophysical problems. It is a great honor and personal pleasure for me to present to you this warm and generous man, whom I have admired and respected for many years, to receive AGU's most prestigious award. Akimoto joins the ranks of other distinguished scientists in the field of mineral physics who have received the William Bowie Medal: Leason Adams in 1950, Francis Birch in 1960, and A. E. Ringwood in 1974.

High-pressure geophysics research was virtually nonexistent in Japan before 1960. In the 22 years since he joined the faculty of the Institute for Solid State Physics (ISSP) of the University of Tokyo, Akimoto has played the leading role in building Japanese high-pressure research as applied to the earth's mantle up to the level where, according to Ted Ringwood, Japan leads the world. Ringwood further attests that, "Akimoto has accomplished this by the example of scientific excellence which he has set in all his research and by his generous encouragement of younger workers."

Two major themes have characterized Akimoto's high-pressure research. He demonstrated the importance of obtaining accurate phase diagrams of major mineral systems as a function of composition, pressure, and temperature. Through quantitative determination of phase transformation boundaries in mantle minerals in the laboratory, Akimoto and his colleagues confirmed the identification of seismic discontinuities in the transition zone (350-1000 km depth) of the earth's mantle with such crystallographic phase transformations. These laboratory data have also been used to estimate the temperature in the transition zone. To make the phase diagrams as accurate as possible, Akimoto devoted considerable time in the establishment of a reliable pressure scale at high temperatures using in situ X-ray diffraction techniques. This work is currently being extended by interfacing a cubic anvil apparatus with the synchrotron radiation facility at Tsukuba, Japan.

Akimoto also recognized the importance of constructing large-volume, compared to diamond anvil, high-pressure, high-temperature equipment in order to conduct research on the physical properties of high-pressure minerals. For this purpose he used many different types of equipment including the tetrahedral anvil, Bridgman anvil, DIA-type cubic anvil, split-cylinder, and slide-type cubic anvil systems. Akimoto was a pioneer in this era of rapid advancement in high-pressure research

during which the maximum pressures attainable at elevated temperature in such large-volume equipment increased from the range corresponding to Moho depths into the lower mantle. Invariably, Akimoto improved many technical points of these systems and used them up to their maximum capability. He likes to describe his laboratory to visitors of the Institute of Solid State Physics as a "museum or warehouse of high pressure equipment," but he believed that characterization when he confided to Don Weidner that "only good instruments survive in my laboratory."

Using these large-volume systems Akimoto's laboratory synthesized many high-pressure minerals for physical-properties experiments in his laboratory and also supplied specimens to many scientists and laboratories within Japan and throughout the world for a wide variety of studies: static compression using high-pressure X-ray techniques (Bassett, Liu, Mao, Takahashi), elasticity measurements using Brillouin scattering (Weidner), and calorimetric studies of the stability of high-pressure phases (Navrotsky).

At the ISSP Akimoto has spawned a long series of outstanding graduate students (Fujisawa, Ida, Sato, Nishikawa, Yagi, Akagi, Hamaya, Fukuzawa), many of whom are now establishing their own laboratories in universities or industrial companies in Japan and abroad. Yoshiko Sato, is here tonight. Akimoto has also played a role in this field by generously encouraging the development of new laboratories in other Japanese universities and by nurturing the careers of many young Japanese scientists in these institutions. As is typical of the man, he assiduously avoids any credit for these efforts.

Akimoto obtained his Ph.D. in 1950 at the University of Tokyo as a student of Takeshi Nagata. He devoted the next 10 years of his career in the study of rock and mineral magnetism at the Geophysical Institute of the University of Tokyo. Following the demonstration by Nagata and Uyeda that self-reversed magnetization was an intrinsic property of certain natural rocks, Akimoto and others synthesized a wide variety of mineral specimens in the laboratory to study the phenomenon of self-reversal. This use of synthetic specimens with controlled stoichiometries was a significant new development in rock magnetic studies. This work was particularly important since, at the time, magnetic field reversals had not yet been demonstrated, and it was believed possible that all observations of reversed remanent magnetism were due to self-reversal. Later, he made important contributions to our understanding of the behavior of magnetic properties in the titanomagnetite and titanomagnetite.

Although his high-pressure research has been principally devoted to geophysical problems, Akimoto has also made important contributions to the solid-state physics of semiconductors and their thermal and electrical transport properties. Within Japan, Akimoto has cultivated a remarkable, symbiotic relationship

between university and industrial programs in high-pressure research. In 1973 the Japan Academy of Sciences awarded Akimoto the Academy Prize for his scientific accomplishments.

Akimoto has admirably represented Japan in international activities ranging from the Upper Mantle Project of the 1980's to the Inter-Union Commission on the Lithosphere of the 1980's. Most recently and most significantly, Akimoto has organized Japan-U.S. seminars on high-pressure geophysics with Murli Mangharam at Honolulu in 1976 and at Hakone, Japan, in 1981. No one who attended the Hakone meeting and the subsequent laboratory tour of Japan will ever forget the scientific excitement or the unsurpassed Japanese hospitality of Akimoto and his countrymen.

In his citation presenting Leason Adams with the William Bowie Medal in 1950, Merle Tuttle recalled that the deed of the 1931 gift for the William Bowie Medal specifies that its award is to be for "distinguished attainment and outstanding contribution to the advancement of cooperative research in fundamental geophysics." I can think of no geophysicist who fits this criterion so well. Mr. President, on behalf of his students and colleagues throughout the world, it is my pleasure to present to you the 1983 William Bowie Medalist, Akimoto-sensei.

Robert C. Lieberman

Nominations for Medals and Awards

William Bowie Medal. Awarded for outstanding contributions to fundamental geophysics and for unselfish cooperation in research.

Maurice Ewing Medal. Honors an individual who has led the way in understanding the physical, geophysical, and geological processes in the ocean; who is a leader in ocean engineering, technology, and instrumentation; or who has given distinguished service to the marine sciences.

Robert H. Horton Medal. Given for outstanding contributions to the geophysical aspects of Hydrology.

James B. Macelwane Award. Up to three awards are given each year for significant contributions to the geophysical sciences by a young scientist

of outstanding ability. Recipients must be less than 36 years old.

Letters of nomination outlining significant contributions and curriculum vitae should be sent directly to the appropriate committee chairman: Bowie Medal - Eugene M. Shoemaker, U.S. Geological Survey, 2255 Central Expressway, Menlo Park, CA 94025; Ewing Medal - Robert O. Reid, Department of Oceanography, Texas A&M University, College Station, TX 77843; Horton Medal - R. Allan Freeze, Department of Geological Sciences, University of British Columbia, Vancouver, B.C., Canada V6T 1W6; Macelwane Award - J. Freeman Garbutt, IGPP A-025, University of California, San Diego, La Jolla, CA 92093.

Deadline for Nominations is November 1, 1983.

Meetings

Announcements Groundwater Conference

The Fourteenth Biennial Conference on Groundwater, sponsored by the University of California Water Resources Center and the California Department of Water Resources, will be held in Sacramento, Calif., on September 19-20, 1983.

The various sessions of the conference will deal with such topics as recent groundwater legislation, California groundwater quality, economic issues in groundwater, fractured rock aquifers, and groundwater contamination from pesticides and organic contaminants.

For the first time a limited number of unsolicited papers will be presented in a poster session at the conference. Submit abstracts for the poster session by July 15, 1983, to John A. Dracup, 7819 Boelter Hall, University of California, Los Angeles, CA 90024. Poster specifications will be sent to selected participants by August 1, 1983.

The deadline for registering for the conference is September 14. For more information, contact The Water Resources Center, University of California, Davis (telephone: 916-752-1544).

Geophysical Year

New Listings

The complete Geophysical Year last appeared in the May 31, 1983, EOS. A boldface meeting title indicates sponsorship or cosponsorship by AGU.

September 19-20, 1983 14th Biennial Conference on Ground Water. Sponsors: University of California Water Resources Center and California Department of Water Resources. (The Water Resources Center, University of California, Davis, CA 95616; telephone: 916-752-1544.)

Oct. 23-28, 1983 Symposium on Neotectonics, Seismicity, and Geologic Hazards in the Caribbean and Venezuela. Caracas, Venezuela. Sponsors: INQUA Neotectonics Commission, Andre M. Singer P., Depto. Ciencias de la Tierra, FUNVISIS, Apartado Postal 1892, Caracas 101, Venezuela; tele: 264533.


October 26-28, 1983 29th Annual Midwest Groundwater Conference. Champaign, IL. Sponsors: Illinois State Water Survey, 605 E. Springfield Avenue, P.O. Box 5050, Station A, Champaign, IL 61820-9050; telephone: 217-333-0235, or Philip G. Reed, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820; telephone: 217-344-1481.

Dec. 5-16, 1983 Workshop on Pattern Recognition and Analysis of Seismicity. Trieste, Italy. (International Center for Theoretical Physics, P.O. Box 586, I-34100 Trieste, Italy.)

Mar. 28-30, 1984 International Symposium on Earthquake Relief to Less-Industrialized Areas. Zurich, Switzerland. (Swiss National Committee for Earthquake Engineering, SIA Postfach, CH-8039, Zurich, Switzerland.)

For actual size, see EOS, p. 135, April 5, 1983.

Sample Abstract	Submital Information
<p>11.8 cm</p> <p>Technique for the Preparation of Abstracts</p> <p>F. S. S. T. AUTHOR [School of Oceanography, Hydro University, Watacom, Mass. 02172]</p> <p>S. G. S. O. AUTHOR [USGS, Woods Hole, Mass. 02543]</p> <p>(Sponsor: T. C. Alvin)</p> <p>Follow this example in typing the abstract. The printing plates will be prepared by photographing the abstracts exactly as they are received, except that abstracts exceeding the maximum length (18 cm or width 11.8 cm) will be cut to standard.</p> <p>Use a good typewriter with a ribbon in good condition. A carbon ribbon gives the best results. There will be a reduction of 50% for the printed abstract volume.</p> <p>Follow these guidelines:</p> <ol style="list-style-type: none"> (1) Type title in capital and lower case letters, except where all capitals are standard. (2) Underline entire title. (3) Leave one line blank after title. (4) Type names of authors in all capital letters, with affiliation and address in capital and lower case letters. Do not leave blank lines between authors. (5) Indicate the name of author who will present paper. (6) If no author in a number of a cosponsor society, type sponsor's name in capital and lower case letters. (7) Leave one blank line after author block. (8) Leave one blank line after author block. (9) Use SI units. <p>NOTE: There are no special forms distributed on a long basis. Use the space provided for the abstract. Please leave at least 1 cm for the margin of paper and abstract title. If the abstract is too long, please use the edge of paper and abstract title.</p>	<p>Submital Information</p> <p>[See explanation]</p> <ol style="list-style-type: none"> 1. Abstract Submission Meeting 2. AGU, AGU, HIR, OCE, AMS, ASA, or 3. AGU (sponsor's name) 4. AGU (sponsor's name) 5. AGU (sponsor's name) 6. AGU (sponsor's name) 7. AGU (sponsor's name) 8. AGU (sponsor's name) 9. AGU (sponsor's name) 10. AGU (sponsor's name) 11. AGU (sponsor's name) 12. AGU (sponsor's name) 13. AGU (sponsor's name) 14. AGU (sponsor's name) 15. AGU (sponsor's name) 16. AGU (sponsor's name) 17. AGU (sponsor's name) 18. AGU (sponsor's name) 19. AGU (sponsor's name) 20. AGU (sponsor's name) 21. AGU (sponsor's name) 22. AGU (sponsor's name) 23. AGU (sponsor's name) 24. AGU (sponsor's name) 25. AGU (sponsor's name) 26. AGU (sponsor's name) 27. AGU (sponsor's name) 28. AGU (sponsor's name) 29. AGU (sponsor's name) 30. AGU (sponsor's name) 31. AGU (sponsor's name) 32. AGU (sponsor's name) 33. AGU (sponsor's name) 34. AGU (sponsor's name) 35. AGU (sponsor's name) 36. AGU (sponsor's name) 37. AGU (sponsor's name) 38. AGU (sponsor's name) 39. AGU (sponsor's name) 40. AGU (sponsor's name) 41. AGU (sponsor's name) 42. AGU (sponsor's name) 43. AGU (sponsor's name) 44. AGU (sponsor's name) 45. AGU (sponsor's name) 46. AGU (sponsor's name) 47. AGU (sponsor's name) 48. AGU (sponsor's name) 49. AGU (sponsor's name) 50. AGU (sponsor's name) 51. AGU (sponsor's name) 52. AGU (sponsor's name) 53. AGU (sponsor's name) 54. AGU (sponsor's name) 55. AGU (sponsor's name) 56. AGU (sponsor's name) 57. AGU (sponsor's name) 58. AGU (sponsor's name) 59. AGU (sponsor's name) 60. AGU (sponsor's name) 61. AGU (sponsor's name) 62. AGU (sponsor's name) 63. AGU (sponsor's name) 64. AGU (sponsor's name) 65. AGU (sponsor's name) 66. AGU (sponsor's name) 67. AGU (sponsor's name) 68. AGU (sponsor's name) 69. AGU (sponsor's name) 70. AGU (sponsor's name) 71. AGU (sponsor's name) 72. AGU (sponsor's name) 73. AGU (sponsor's name) 74. AGU (sponsor's name) 75. AGU (sponsor's name) 76. AGU (sponsor's name) 77. AGU (sponsor's name) 78. AGU (sponsor's name) 79. AGU (sponsor's name) 80. AGU (sponsor's name) 81. AGU (sponsor's name) 82. AGU (sponsor's name) 83. AGU (sponsor's name) 84. AGU (sponsor's name) 85. AGU (sponsor's name) 86. AGU (sponsor's name) 87. AGU (sponsor's name) 88. AGU (sponsor's name) 89. AGU (sponsor's name) 90. AGU (sponsor's name) 91. AGU (sponsor's name) 92. AGU (sponsor's name) 93. AGU (sponsor's name) 94. AGU (sponsor's name) 95. AGU (sponsor's name) 96. AGU (sponsor's name) 97. AGU (sponsor's name) 98. AGU (sponsor's name) 99. AGU (sponsor's name) 100. AGU (sponsor's name)



Ocean Sciences Meeting

Abstract Deadline:
October 19, 1983
New Orleans, Louisiana
Jan. 23-27, 1984

Call for Papers

Abstracts must be received at AGU by October 19, 1983. Late abstracts (1) may be summarily rejected by program chairman or (2) if accepted, will be charged a \$25 late fee in addition to the regular publication charge and may not be published in advance of the meeting.

The 1984 Ocean Sciences Meeting of the American Geophysical Union (AGU) will be held January 23-27, 1984, in New Orleans, La. Housing and registration information will be published in EOS and will be mailed to anyone requesting information on the meeting. Cosponsoring societies are the American Society of Limnology and Oceanography (ASLO); the Acoustical Society of America (ASA); the American Meteorological Society (AMS); the Marine Technology Society (MTS); and the Institute of Electrical and Electronics Engineers Oceanic Engineering Society (OES).

General Regulations

Abstracts may be rejected without consideration of their content if they are not received by the deadline or are not in the proper form. Abstracts may also be rejected if they contain material outside the scope of the meeting or if they contain material already published or presented elsewhere. Only one contributed paper by the same first author will be considered for presentation; additional papers (unless invited) will be automatically rejected.

Abstracts not authored by a member of AGU or of one of the cosponsoring societies must be sponsored by such a member; this includes invited abstracts.

There is a publication charge of \$40 (\$30 if prepaid) for each abstract. The publication charge is only \$20 (\$15 if prepaid) if the first author is a student. Both invited and contributed papers are subject to the publication charge. Prepayment of the publication charge saves money. Send a check for \$30 (\$15 for students) with your abstract. Abstracts must be received at AGU by October 19 to avoid an additional \$25 charge.

(Cont. on p. 448)